EFFECT OF CHEMICAL TREATMENTS AND COLD STRATIFICATION ON DORMANCY BREAKING TO PROMOTE GERMINATION IN ISRAEL BLUE (*Vitis vinifera L.*) GRAPES VARIETY

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Introduction

Seed Dormancy is a process of blocking germination completely in viable seeds under favorable environmental conditions. It can protect seeds from hard environmental conditions and can disperse through a large extended area. In the process of seed germination, grape seeds show low germination rates, a long period for germination and it affects badly in grapes breeding programs due to seed dormancy. Seed germination percentage and seedling vigor can be increased with the application of chemicals like Gibberellic acid and controlling the temperature **[**1] by breaking the seed dormancy. Grape seeds can be easily germinated under cold stratification with the favored low temperatures [2]. This study aims to determine the effects of four pretreatments with an application of chemicals and cold stratification under different temperatures less than 10˚C to increase the germination capability of grape seeds within a short period.

Materials and Methods

The research was conducted in the Jaffna University Research and training center. The study was carried out in a two-factor factorial Complete Randomized Design using four replicates. Each replicate had 14 seeds. Totally 1120 grape seeds were sown.

Plant material

Open-pollinated seeds of Israel blue (*Vitis vinifera L.*) were used for all treatments. Fully ripe berries were collected from grape farmers in the Jaffna district. Seeds were extracted, washed, checked for viability, and air-dried for 2 days.

Methodology

Seeds received pretreatments with chemicals before cold stratification. 1) 48 hours water soak (control), 2) 24 hours soak in 1000ppm H_2O_2 followed by 24 hours soak in water, 3) 24 hours soak in GA_3 followed by 24 hours soak in water, 4) 24 hours soak in Acetic acid followed by 24 hours soak in water [3].

Seed stratification

Five different temperatures less than 10˚C were used in this study. Temperatures of, 4˚C, 5˚C, 6˚C, 7˚C, and 8˚C were chosen, correspondingly. Because of low-temperature differences between 10˚C and 5˚C stratification for 21 days quickly break the grape seed dormancy.

Seed sowing

Pretreated stratified seeds were sown in media (1:1:1 in ratio sand: topsoil: farm manure). Seeds with media were placed in a growth chamber by organized in a completely randomized design with five replicates by providing the conditions of 30 °C for 16 light hours (12.5 lux of light intensity) and 25 °C for 8 dark hours with 65 % relative humidity which condition is the ideal to promote germination in grapes.

Data Analysis

The number of seeds germinated under different treatment combinations; time taken for germination were measured. Collected data were analyzed in SAS 9.1 version and DMRT mean separation was done to identify the suitable treatment combination.

Results and Discussion

The results were shown that germination was increased with a cold stratification temperature of 4 °C and 5 °C with the application of Gibberellic acid 1000 ppm concentration. 30% of grape seeds germination was observed under Gibberellic acid application with stratification temperatures of 4 °C and 35 % grape seeds germination from the application of Gibberellic acid with stratification temperature of 5 °C.

Table 1. The interaction between four chemical applications and five stratification temperatures, after 50 days of grape seed germination

GSI (Germination Speed Index)	**Stratification Temperatures**				
Treatments	**4˚C**	**5˚C**	**6˚C**	**7˚C**	**8˚C**
Water	15%	12.5%	7.5%	12.5%	0%
Hydrogen peroxide	**25%**	17.5%	17.5%	17.5%	17.5%
Acetic acid	15%	32.5%	12.5%	22.5%	15%
Gibberellic acid	**30%**	**35%**	15%	12.5%	17.5%

The percentage of seeds that germinated was gradually raised as the stratification period progressed up to 21 days. The germination of grape seeds was significantly improved when they were stratified at a low temperature.

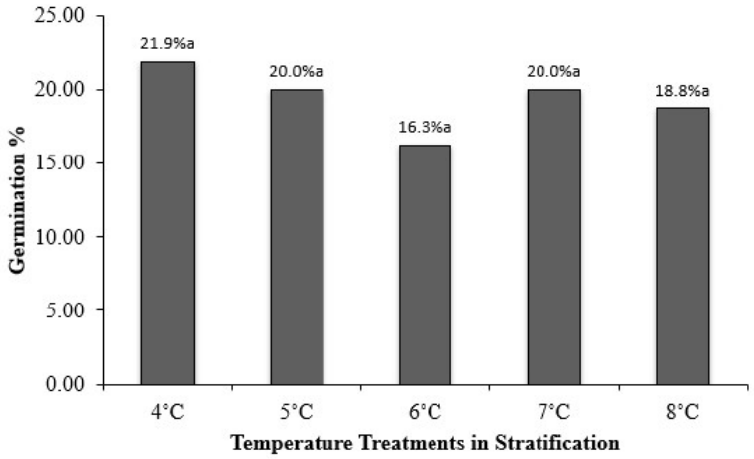

Figure 1. Grape seed Germination Percentage at alternate Stratification Temperatures. The same letters are indicated not significantly different by DMRT at p=0.05

There was a significant difference observed among the application of different chemicals as treatments when seeds were soaking (Figure 2). Grape seeds Soaking in acetic acid for 24 hours before cold stratification treatment results in a limited effect on seed germination (15%). Soaking grape seeds in Hydrogen peroxide solution had little effect on germination percentage (25.5%). Gibberellic acid especially at 1000 ppm, gave the best results concerning germination percentage (26.5%). It was found that the Gibberellic acid treatment promoted the germination of grape seeds (Darné, 1996). The application of Gibberellic acid will break the embryo dormancy of grape seeds and increase the Grape seed Germination percentage. Hydrogen peroxide stimulates dormancy breaking and can damage seed outer coat tissues.

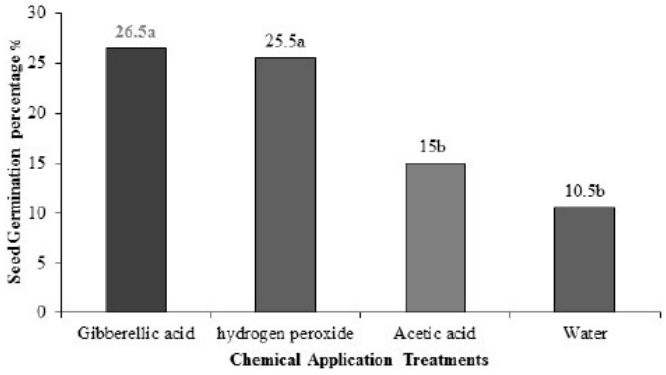

Figure 2. Grape seed Germination Percentage with the application of different chemical treatments when in Grape seed soaking. Different letters are indicated significantly different by DMRT at p=0.05

In general, grape seeds required 120days for germination without pretreatments. [4,5]. But with the application of cold stratification treatments, it was taken around 27 days to germinate after grape seed soaking. Cold stratification is sensitive to induce breaking grape seed dormancy (Figure 3). When increasing the stratification period, will increase the ability of the grape seed to germinate.

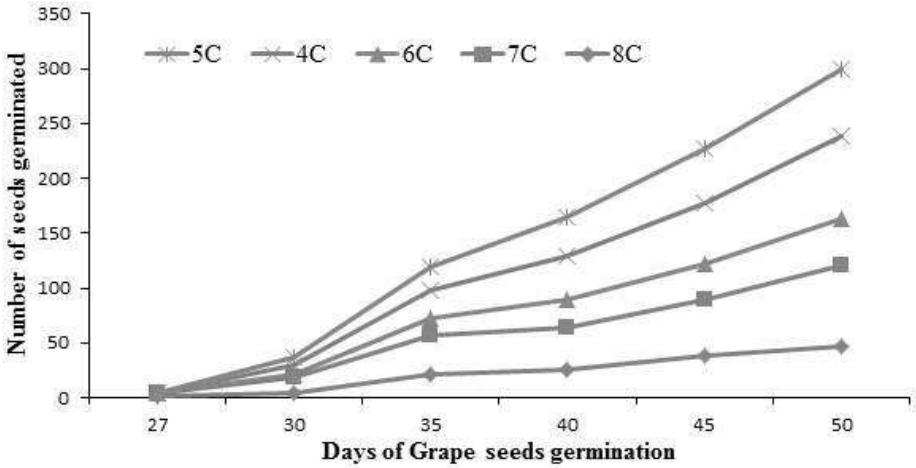

Figure 3. Mean grape seed germination with 27 days from seed soaking was observed with the effect of Stratification temperature treatments

The highest grape seed germination within a short period was obtained with the application of Gibberellic acid solution before sowing (Figure 4). Grape seed germination was taken place 12 days after the stratification period with the treatment of Gibberellic acid.

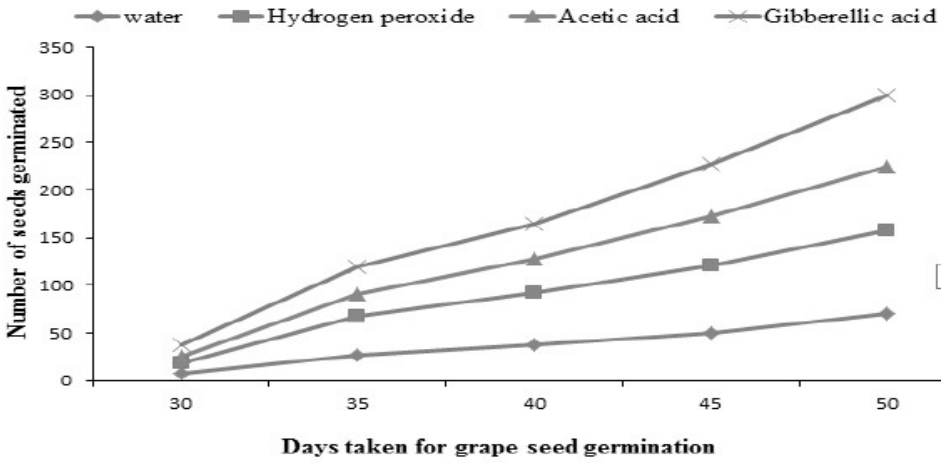

Figure 4. Mean grape seed germination with 27 days from seed soaking was observed with the effect of different chemical applications

Conclusion and Recommendations

From this study it can be concluded that Gibberellic acid application and cold stratification temperatures of 5 °C as good treatment combination to promote quick germination in grapes by breaking both embryo and seed coat dormancy.

References

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